Last Name:_____ First Name:_____

1.) False

2.) False

3.) True

4.) False

5.) False

6.) False

7.) 25

8.) 64

9.) 10,000

10.) $\frac{8}{27}$

11.) 4

12.) $-\frac{3}{10}$

13.) 2

14.) $\log_e(5)$

15.) $\frac{1}{64}$

16.) $\log_e(2)+3$

17.) $e^{16}-2$

18.) $\frac{\log_e(4)-1}{5}$

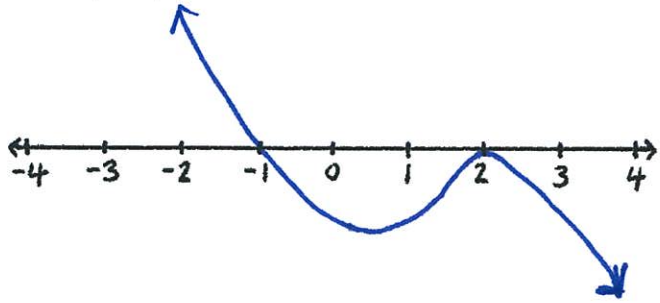
19.) e^2-1

20.) -2

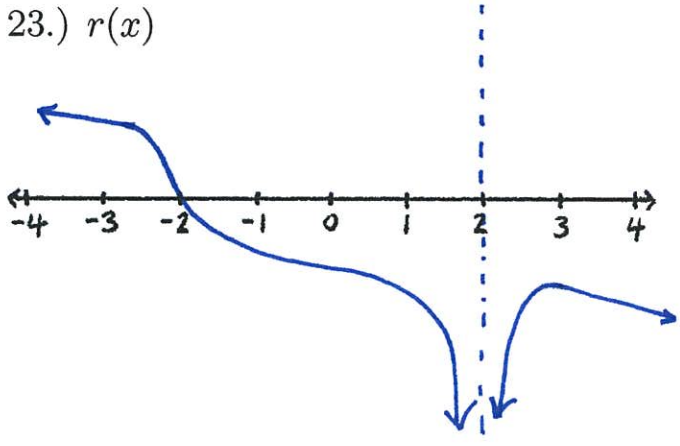
21.) $4(x+1)(x-\frac{3}{2})(x-\frac{1}{2})$

****

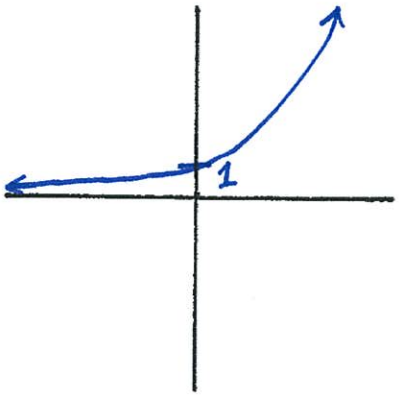
22.) $p(x)$



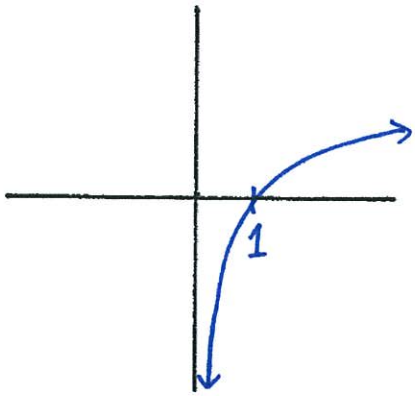
23.) $r(x)$



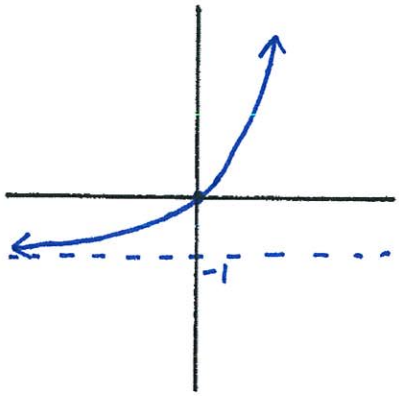
24.) e^x



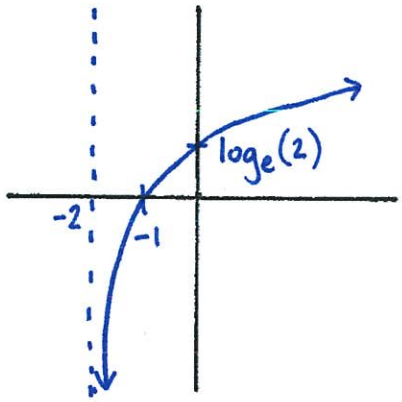
25.) $\log_e(x)$



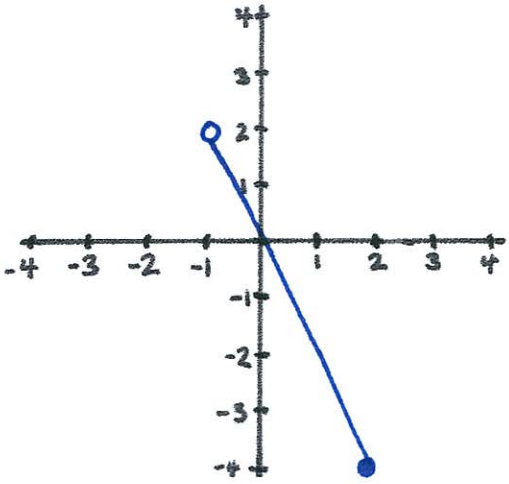
26.) $e^x - 1$



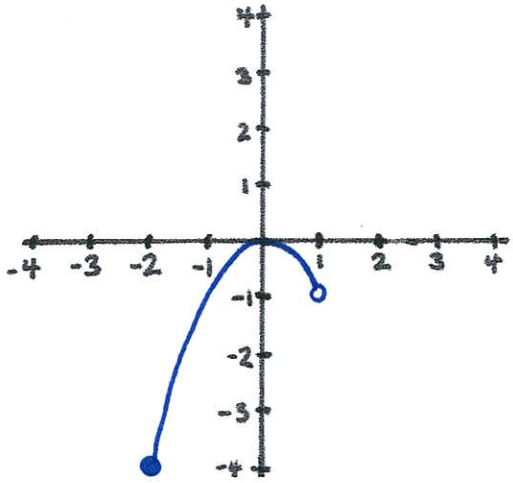
27.) $\log_e(x+2)$



28.) $f(x)$



29.) $g(x)$



Third Practice Exam

For #1-6 write the entire word "True" or the entire word "False".

1.) $a^x a^y = a^{x-y}$ False. $a^x a^y = a^{x+y}$

2.) $\frac{a^x}{a^y} = a^{xy}$ False. $\frac{a^x}{a^y} = a^{x-y}$

3.) $\log_a(zw) = \log_a(z) + \log_a(w)$ True

4.) $\log_a(z^w) = \log_a(z)^w$ False. $\log_a(z^w) = w\log_a(z)$

5.) $\log_a(\frac{z}{w}) = \log_a(z)\log_a(w)$ False. $\log_a(z/w) = \log_a(z) - \log_a(w)$

6.) $(a^x)^y = a^{x+y}$ False. $(a^x)^y = a^{xy}$

****

7.) Write $5^{928}5^{-900}5^{-26}$ as a rational number in standard form.

$5^{928-900-26} = 5^2 = 25$

8.) Write $(4^{\frac{2}{5}})^{\frac{15}{2}}$ as a rational number in standard form.

$4^{(2/5)(15/2)} = 4^3 = 64$

9.) Write $1,000,000^{\frac{2}{3}}$ as a rational number in standard form.

$(10^6)^{2/3} = 10^{(6)(2/3)} = 10^4 = 10,000$

10.) Write $(\frac{9}{4})^{-\frac{3}{2}}$ as a rational number in standard form.

$(4/9)^{3/2} = \left(\sqrt{4/9}\right)^3 = (2/3)^3 = 8/27$

11.) Write $\log_{10}(10,000)$ as a rational number in standard form.

$\log_{10}(10^4) = 4$

12.) Write $\log_5(\frac{1}{\sqrt[10]{125}})$ as a rational number in standard form.

$\log_5(5^{-3/10}) = -\frac{3}{10}$

13.) What is the greatest integer that is less than $\log_4(50)$?

$4^2 < 50 < 4^3$

$\Rightarrow \log_4(4^2) < \log_4(50) < \log_4(4^3)$

$\Rightarrow 2 < \log_4(50) < 3$

14.) Solve for x if $e^x = 5$

$x = \log_e(5)$

15.) Solve for x if $\log_4(x) = -3$
(Write your answer as a rational number in standard form.)

$x = 4^{-3} = \frac{1}{4^3} = \frac{1}{64}$

16.) Solve for x if $4e^{x-3} = 8$

$e^{x-3} = \frac{8}{4} = 2$

$x - 3 = \log_e(2)$

$x = \log_e(2) + 3$

17.) Solve for x if $\log_e(x+2) - 7 = 9$

$\log_e(x+2) = 9+7 = 16$

$x+2 = e^{16}$

$x = e^{16} - 2$

18.) Solve for x if $e^{3x+1} = \frac{4}{e^{2x}}$

$e^{2x} e^{3x+1} = 4$

$e^{5x+1} = 4$

$5x+1 = \log_e(4)$

$5x = \log_e(4) - 1$

$x = \frac{\log_e(4) - 1}{5}$

19.) Solve for x if $\log_e(x^2+x) - 2 = \log_e(x)$

$\log_e(x^2+x) - \log_e(x) = 2$

$\log_e\left(\frac{x^2+x}{x}\right) = 2$

$\log_e(x+1) = 2$

$x+1 = e^2$

$x = e^2 - 1$

20.) Find a root of $x^3 + x^2 - x + 2$

Factors of 2 are $1, -1, 2, -2$.

-2 is a root since

$$(-2)^3 + (-2)^2 - (-2) + 2 = -8 + 4 + 2 + 2 = 0$$

21.) Completely factor $4x^3 - 4x^2 - 5x + 3$ (Hint: -1 is a root.)

$$\begin{array}{r|rrrr} -1 & 4 & -4 & -5 & 3 \\ & & -4 & 8 & -3 \\ \hline & 4 & -8 & 3 & 0 \end{array}$$

$4x^3 - 4x^2 - 5x + 3$

$(x+1)$ $(4x^2 - 8x + 3)$

(4) $(x - 3/2)$ $(x - 1/2)$

Discriminant of $4x^2 - 8x + 3$ is $(-8)^2 - 4(4)(3) = 64 - 48 = 16$.

$16 > 0$, so there are two roots of $4x^2 - 8x + 3$. They are

$$\frac{-(-8) + \sqrt{16}}{2(4)} = \frac{8+4}{8} = \frac{12}{8} = \frac{3}{2}$$

and $\frac{8-4}{8} = \frac{4}{8} = \frac{1}{2}$.

Therefore,

$$4x^2 - 8x + 3 = 4(x - 3/2)(x - 1/2)$$

22.) Graph $p(x) = -3(x+1)(x-2)(x-2)(x^2+7)$

(•) x-intercepts: $-1, 2$

(•) $p(x)$ is negative between -1 and 2 since $p(0) = -3(0+1)(0-2)(0-2)(0^2+7) < 0$

(•) Far right and left of graph looks like the leading term of $p(x)$, $-3x^5$

23.) Graph

$$r(x) = \frac{2(x+2)(x^2+3)}{-5(x-2)(x-2)}$$

(•) vert. asym.: 2

(•) x-int: -2

(•) $r(x)$ is negative between 2 and -2 since $r(1) = \frac{2(1+2)(1^2+3)}{-5(1-2)(1-2)} < 0$

(•) Far right and left of graph looks like $\frac{2x^3}{-5x^2} = \left(-\frac{2}{5}\right)x$

24.) Graph e^x and label its y-intercept.

25.) Graph $\log_e(x)$ and label its x-intercept.

26.) Graph $e^x - 1$ and label its x- and y-intercepts (if there are any).

e^x shifted down by 1.

y-int: $e^0 - 1 = 1 - 1 = 0$

x-int: $e^x - 1 = 0 \Rightarrow e^x = 1 \Rightarrow x = 0$

27.) Graph $\log_e(x+2)$ and label its x- and y-intercepts (if there are any).

$\log_e(x)$ shifted left by 2.

y-int: $\log_e(0+2) = \log_e(2)$

x-int: $\log_e(x+2) = 0 \Rightarrow x+2 = e^0 = 1 \Rightarrow x = 1-2 = -1$

28.) Graph $f : (-1, 2] \to \mathbb{R}$ where $f(x) = -2x$.

$f(-1) = -2(-1) = 2$

$f(2) = -2(2) = -4$

29.) Graph $g : [-2, 1) \to \mathbb{R}$ where $g(x) = -x^2$.

$g(-2) = -(-2)^2 = -4$

$g(1) = -(1)^2 = -1$